CLAIMS

I claim:

1. An interleaved friction plate braking device in which the plates can be clampingly engaged to ~~synchronize accelerate or~~ decelerate a load, means for cooling the friction surfaces using a multiplicity of external closely confined impeller vanes on the outside diameter of the rotating plate to impact a stationary fluid reservoir and impart inward flow thru passages to cool and lubricate the sliding friction surfaces during rotational operation.

2. The device as set forth in Claim 1 in which inward flow occurs during a portion of a revolution of rotation and outward flow occurs during the remainder of the revolution to provide inward and outward friction surface cooling during a revolution cycle.

3. A wet friction plate ~~comprising~~ comprised of a core with attached annular friction discs, the core having a multiplicity of pumping impeller vanes extending from its outer diameter acting as pump impellers in cooperation with stationary mating side plates to ingest coolant and impart inward flow thru ~~the friction surface grooving~~ grooves to provide cooling during rotation of the friction plate.

4. The device as set forth in Claim 3 in which an individual pressure chamber is defined by the stationary confining mating side plate walls adjacent to the impeller vane, the impeller vane pumping surface and the friction plate core outside diameter between the pumping surface of an impeller and the back side of the adjacent leading impeller vane.

5. Canceled. The device as set forth in Claim 3 in which the individual pressure chamber between the impelling surface and the back of the adjacent ahead leading vane may form a circular chamber for a large portion of its ~~periphy~~ periphery.

6. The device as set forth in Claim 3 in which each impeller vane has a leading outer tip and following backward or trailing slant or curvature with respect to the direction of rotation of the rotating disc.

7. The device as set forth in Claim 3 in which coolant accelerated by the leading pumping surface of an impeller vane may follow the friction plate core outer diameter between vanes and abut a decelerating cavity formed in the rear surface of the leading adjacent impeller vane to discharge inwardly thru ~~the friction surface grooving~~ a groove to cool and lubricate the friction surfaces.

8. An interleaved friction plate braking device in which the plates can be clampingly engaged to ~~synchronize, accelerate or~~ decelerate a load, means for cooling the friction surfaces using a multiplicity of external closely confined vanes on the outside diameter of the rotating plates to ingest coolant from ~~an enclosing~~ a stationary housing reservoir or an external supply source directed into the pressure chamber inlets described as two adjacent vanes, and their mating stationary side walls.

9. The device as set forth in Claim 4 in which the inlet area for an individual pressure chamber is made up of the space between two stationary adjacent impeller vane plate side walls and the outer peripheral distance between adjacent impellers tips.

ANALYSIS OF MALINOWSKI 4,022,289

We interpret Malinowski as a wet brake with stationary and rotating plates, the rotating friction plates dipping into a stationary sump of oil. As stated grooves and slots in the friction surfaces pass thru the oil bath. The slots may be in the friction material only or cut thru the core and both attached friction surfaces.

In traditional pump design the pumping blades occupy but a small portion of the pumping volume.

In Malinowski the pumping blades occupy a large percent of the friction area and consequently have small inlet area. Changing these areas affects the friction material surface area which absorbs the engagement heat and resists surface wear. Large inlet area results in low friction rubbing surfaces.

For application 10/760,981 the pumping blades extend beyond the rotating friction plate core and may have minimal affect on the friction surface area while providing large inlet suction area.

The application embodies both a pump and a brake as integral components.

ANALYSIS OF BORCK ET AL. 3,897,860

My understanding of Borck is that this clutch is mounted on the engine flywheel, and rotates only when the engine is running. Relative movement between the clutch disc and flywheel occurs when the clutch is disengaged or engaging. The annular operating sump has an irregular O.D. but a constant I.D. when the flywheel is rotating.

The scoops are continuously in the rotating annular sump and scoop intermittently when engaging or release action occurs. Scooped fluid is returned thru the friction surface grooving outward to the annular sump.

For application 10/760,981 fluid is pumped by closely confined extending vanes rotating between stationary mating plate housings. Fluid displaced inwardly thru grooves is replaced by atmospheric pressure. The vanes occupy a minimal amount of the pump volume. An individual inlet area is the product of the width between two adjacent stationary plates and the peripheral distance between the forward tip of a pumping vane and to backward tip of the vane ahead. Clearance between a rotating vane and its stationary plate housing surface is the thickness of the friction material usually in the order of .015" to .020" consistent with centrifugal pump clearance practices. The vanes or scoops only contact the sump area a small part of each revolution. Fluid exhausts to atmosphere to return to the stationary sump after cooling the friction surfaces.

The application has many of the characteristics of conventional pump design.

Differences between the application and the Borck claims are we believe:

- Claim 1 we have no flywheel.
- Claim 5 and 7 we have only a driven member having only absolute rotation with respect to the stationary plates.

- Claim 10 we have no driving shaft, nor sealed housing sump that can confine centrifugal pressure.